# Amputation-related Factors Influencing Activities of Daily Living among Amputees

**Abstract** This study aimed to determine amputation-related factors that affected the activities of daily living in persons with amputations. A descriptive cross-sectional study was conducted in Babylon Rehabilitation Centre from August 1st and November 20th, 2023. The study sample consists of 250 amputees using a standardized questionnaire. Data were collected through the interviews and analyzed by applying descriptive and inferential statistical approaches. Findings indicate significant portion of amputees (63.6%) exhibited poor activities of daily living, with factors such as age (p=0.000), gender (p= 0.008), amputation reasons (p= 0.000), site (p= 0.005), and duration (p=0.000) being predictive variables according to simple linear regression analysis. The study highlights a worrying prevalence of poor activities of daily living among amputees, with amputation-related factors serving as important predictors. Interventions aimed at enhancing ADL function among amputees must adopt a comprehensive approach that addresses the variety of factors that influence daily functioning.
**Keywords** Amputation, Influencing Factors, Activities of Daily Living, Amputees

## 1. Introduction

The ICF is the framework of the WHO, the basic framework through which we understand disability, and on this, the ICF serves as a foundation. Given that the ICD is comprehensive, the model also takes into account not only personal [1] but also the activities and environmental factors. This is a holistic perspective that understands disabilities as a result of interaction among various levels rather than a single level [2].

Amputation which is the most frequent operation due to traumas and diseases is the one that can remain with us for years both psychomatically and physically. For instance, amputation will also be an ambiguous condition that can greatly affect the individual's activities, and the way he or she interprets the environment. [3]. According to the international classification of WHO, this is the most important aspect of assessing life experiences of people, who had a limb amputated and will have a higher-quality life after the intervention. One of the most supported sections of the research paper will be the thorough literature review on the effects of limb loss due to the citation of the particular functional effects of amputation and the factors that have an impact on these effects. By condensing the available material researchers can make the data visual, whereby they can identify differences and possible gaps. Additionally, the systematic review is a very in-depth assessment of the approaches used in the different studies, therefore the review is a comprehensive and well-founded evidence-based conclusion [5,6].

The subject of amputation-related factors influencing the activities of daily living (ADL) among amputees is a rather complex and intricate task that is nonetheless very important in clinical and policy matters [7]. It involves several functions that people perform on their own to stand on their own feet, while this further involves mobility, personal hygiene, and housekeeping management. To be able to treat and support the people who underwent amputation even on the individual level highly depends on the knowledge of these activities' impact [8].

The amputation adjustment is not an easy thing to do and one's everyday life is altered significantly which is complicated by numerous factors, like the demographic characteristics and the circumstances of the amputation itself [9]. Amputees' rehabilitation cycle includes acceptance and understanding of limitations imposed on them by losing a body part and knowledge of factors that determine their ability to carry out activities of daily living (ADL) should be a priority [10]. There is a unanimous view amongst medical experts that the high age of the person affected plays a very serious role in the success of the rehabilitation and adaptation of the patient after undergoing an amputation. Studies show that it is not only the elderly who have more difficulty with relearning ADLs compared to the not-old than their bodies because they possess comparatively fewer physiological reserves and comorbidities. Accordingly, older people may also have difficulty accepting and adapting to a condition that is different from what they normally have, which in turn may affect their independent ability to do many things [11]. Stereotypes of males and females and their activities of daily living due to gender differences also influence the ADL level of amputees. Various studies show that gender is a determining factor, both in the outcome of functional ability

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after amputation and in the use of a prosthetic device [12]. To illustrate, it is highlighted in the text that female amputees often face unique issues regarding prosthetic fit and comfort, which may be problematic, when performing an ADL [13].

The reasons for amputation, whether damage, vascular disease, or congenital disease, all play a very vital role in the functional outcomes and impaired activities of people who have undergone amputation. To illustrate, people who undergo amputation for vascular disease may have a broader range of functional limitations than those who physically damage their limbs, as vascular disease typically involves multiple limbs and systemic problems [14]. Furthermore, the emotional consequences of the wound that caused the amputation may have an impact on the patient's motivation and resilience during the rehabilitation process and, as a result, affect ADL performance [15]. Whether or not the amputation site is affected during the procedure and the length of time since the time of the procedure also play a role in how well a person can complete the ADL. Proximity to the center of body mass because the prosthesis sits on the residual limb and residual limb pain can influence functional outcomes and the choice of prosthetic devices [16]. Moreover, the time following amputation will show the individual adjustment and adaptation process, while the early stages after amputation will be more intense than the later stages, which focus on long-term functional independence [17]. Understanding the changing nature of these factors over time is a key point to note for the successful design of personalized approaches aimed at improving ADL outcomes in amputees. Therefore, this study aimed to investigate the factors associated with amputation influencing activities of daily living among amputees in Babylon/ Iraq.

## 2. Materials and Methods

### Research Design

In this research, the descriptive cross-sectional method was employed. The data was collected from August 1st and November 20th, 2023. Within the study population, 2507 individuals per month attended the Babylon Rehabilitation Center. Following the study standards, a sample of 10 % of the total target population was selected. These participants were selected based on the following inclusion criteria including voluntary participation is crucial to this study. Participants must be between 18 and 65 years old, the first cannot adopt a statement of opinion and the second cannot concentrate with the researchers in collecting data, while also ensuring that the researchers can collect data effectively without distraction. In addition, individuals who have experienced an amputation for at least six months are invited to participate. This group provides valuable insights, as their experiences of adjusting to life after amputation could contribute significantly to the study findings.

### Study Instrument

Three tools were used for data collection in this study:

1) Amputation-related factors created for this study by researchers obtained information about the amputees related to their amputation including participants' age, gender, amputation reasons, sites, and duration.

2) Activities of Daily Living: This tool was adopted and developed by previous research to investigate the physical functions of amputees [18]. These activities or functions include bathing and personal hygiene, dressing and changing clothes, using healthcare facilities, walking and movement, and health problems associated with the amputation. A total of (26) items of activities of daily living were measured on a 3-level type of Likert Scale (0=never, 1=sometime, 2=always). Accordingly, points can be taken range from 0-52. The higher average is defined as a higher level of activities of daily living. Cronbach-α was found as 0.87.

### Data Collection

In the study, those who underwent an amputation were identified among those, on the patient list identified by examining the archives of institutions. The phone numbers and home addresses of the amputees on the list who met the search and contact criteria were obtained. The purpose of the research was announced during the interviews, and a date was set for the amputees who agreed to participate in the study. At the time of the appointment, questionnaires were administered to them while they were present for treatment. Researchers filled out data collection forms during personal interviews with the amputees. Each interview lasted about 20-25 minutes.

### Statistical Analysis

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All statistical analyses were performed using the IBM SPSS 20.0 software. Numbers and percentages were employed to rank the variables, while mean and standard deviation were utilized to statistically describe the continuous variables. A Kolmogorov-Smirnov (K-S test) and Shapiro-Wilk tests were used to test normality. Additionally, associations and predictions between the study's variables were examined using the Simple Linear Regression test. A significance threshold of 0.05 was applied to the statistical interpretations that were employed.

## 3. Results

Regarding participants' age results, it shows an average participant of 50 years (or 13.47 years). The participants between 50 and 59 years stand to be the greatest with (32.8%). Notably, (67.6%) were male as compared with those who are female (32.4%). The conditions (diseases) were the more prevalent causes of amputation (58.8%). The lower limb amputation was predominated (59.2%) as compared with those who are upper limb (40.8%). Duration of more than 10 years was highest (48.4%). Those whose limbs were amputated more than 10 years ago recorded the highest percentage in the study (48.4%) (see Table 1).

**Table (1):Sociodemographic Characteristics of Studied Sample**

| SDVs | Classification | No. | % |
|---|---|---|---|
| Age/years (*M± SD= 50 ±13.47*) | <30 | 27 | 10.8% |
| | 30-39 | 30 | 12.0% |
| | 40-49 | 35 | 14.0% |
| | 50-59 | 82 | 32.8% |
| | 60-69 | 76 | 30.4% |
| Gender | Male (1) | 169 | 67.6% |
| | Female (2) | 81 | 32.4% |
| Amputation reason | Condition (Diseases) (1) | 147 | 58.8% |
| | War (2) | 75 | 30.0% |
| | Accident (3) | 28 | 11.2% |
| Amputation site | Lower extremities (1) | 148 | 59.2% |
| | Upper extremities (2) | 102 | 40.8% |
| Amputation duration | <5 years | 62 | 24.8% |
| | 5-10 years | 67 | 26.8% |
| | >10 years | 121 | 48.4% |

The specifications of amputations (as shown in statistics) depict several vital points about this medical procedure and its consequences. For instance, the average age of individuals with an amputation is 50 years, which is 13.47 years in some cases, showing that amputation is not only among young people but rather involves all ages. It contradicts a popular stereotype of amputees as aged persons, therefore drawing attention to the necessity of the multifaceted perspective in the amputation problem across different age groups.

Furthermore, how the gender ratio among amputees is noteworthy. The result shows that males were mostly represented with 67.6% as against 32.4% female. In the warrant of gender inequality, more research must be undertaken to identify whether there are gender-specific risk factors or there is a gender difference in the accessibility of healthcare services that are meant to save limbs and prevent amputation.

To add to this, the major causes of amputations which are diseases being the leading factor accounting for 58.8% of all cases point to the fact that the management and prevention of diseases are crucial in the reduction of the need for limb amputations. Therefore, the best treatment of amputations involves early detection and appropriate care of the underlying health conditions that make patients more susceptible to amputations, such as diabetes, peripheral vascular disease, and trauma.

This dominance of lower limb amputations over upper limb amputations with a 59.2% occurrence of the first, highlights the crucial negative effects of mobility and functional loss that are caused by lower limb amputation. This underlines the fact that complete rehabilitation programs should be developed to help these people restore their mobility independence, and quality of life.

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Also, the fact that almost half of the people (48.4%) had endured amputation for more than ten years is evident proof of the adverse effects of limb loss and the ensuing long-term challenges. This proves the point that continuing help, rehabilitation, and prosthetic services are needed to provide the necessary services that change as people live with limb loss over time.

Findings in Table (2), show a significant proportion (63.6%) of amputees were poor activities of daily living as indicated by average scores (16.01±11.05) (see Table 2).

**Table (2): Overall Assessment Activities of Daily Living**

| Scale | M ± SD | Score | No. | % |
|---|---|---|---|---|
| Activities of Daily Living | 16.01±11.05 | Poor | 159 | 63.6% |
| | | Moderate | 73 | 29.2% |
| | | Good | 18 | 7.2% |
| | | Total | 250 | 100.0% |

The results of the study highlight an alarming issue, which is that the dexterity of amputees is greatly limited in the things that they do in their daily living activities (ADLs). This data shows that a considerable part, about 63.6% of the subjects, encountered difficulties with these activities. This figure demonstrates how severe the loss of a limb can be in terms of preventing a person from being fully independent and his or her normal life standards. The pooled scores also reveal the magnitude of the problem and the participants, on average, scored 16.01±11.05, which demonstrates a substantial compromise of their ability to carry out their ADL.

This set of findings is in line with the results from other studies which indicate the complex problems faced by people after they have undergone amputation [19,20]. The amputation does not only involve physical adaptation but also mental and social consequences [7]. The stumbling blocks in ADLs accentuate the significance of encompassing rehabilitation techniques which are customized to handle the multi-faceted requirements of amputees. Another point worth mentioning is the necessity to intensify support networks and infrastructures that will allow for the improvement of quality of life and better implantation outcomes [21].

The reason behind these results could be to emphasize the bodily implications of limb loss. Most of the time amputation of a limb makes hobbling around and gripping objects hard, which means that these activities which are so important for competence in ADL tasks like bathing or dressing become very difficult to perform. Research shows that this loss of balance can lead to diminished strength and coordination, which are the key components to performing the daily activities of a person on their own [22]. As an add-on, phantom limb pain, and residual limb pain can also be a hindrance for people with amputation to effectively participate in ADLs comfortably.

In addition, the impact on the mind which is caused by amputation should not be overlooked. After their limbs are removed, amputees often suffer mental health problems like depression, anxiety problems, and low self-esteem that may be destructive to their daily motivation including motivation to do even simple tasks [24]. Besides the damage to mental health, when one is struggling with life after limb loss, leading to feelings of powerlessness, can also make it difficult to carry out daily activities.

Furthermore, it can be stated that socioeconomic factors are also at play in amputees' ADLs limitations. It is stated that low-income people are more likely to be affected by being mostly vulnerable to various health risks and also they have the least access to resources such as assistive devices and rehabilitation services [3]. Lack of finance may be a barrier for those amputees not to have a prosthesis or not go through the rehab program, which can be a hurdle to recovery and the ability to have independent function.

This result of the research can be considered as showing the need to develop comprehensive rehabilitation interventions that can be used for dealing with the different problems derived from amputation in performing ADL. The services may entail both physical exercise and emotional support with social help that is individualized to meet the needs of amputees. For one, the cost of prosthetic limbs decreased while the introduction of physical therapy and pain management interventions helped injured people restore their physical functioning and relieve pain in these amputees. Apart from that, psychological support programs that would help people adapt to new conditions, build self-esteem, and fit into their community could improve the mental health and coping skills of amputees.

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The linear regression (see Table 3) found the significant predictors of the ADL in amputees to be age (β= -0.161; p= 0.000), gender (β= -0.135; p=0.008), reasons for the amputation (β=0.304; p= 0.000), input.

**Table (3): Liner Regression among the Study Variables in Predict the Activities of Daily Living**

| Variables | Unstandardized Coefficients | | Standardized Coefficients | T | *Sig.* |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Age | -1.357 | .380 | -.161 | -3.572 | .000 |
| Gender | -3.198 | 1.187 | -.135 | -2.695 | .008 |
| Amputation reasons | 4.908 | .828 | .304 | 5.930 | .000 |
| Amputation Site | 3.108 | 1.102 | .138 | 2.820 | .005 |
| Amputation Duration | -5.050 | .687 | -.374 | -7.350 | .000 |

*Dependent Variable: Activities of Daily Living.*

**ADL and Age**

The results of simple linear regression analysis show that the age of participants is a significant factor that influences the activities of daily living (ADL) of amputees. The negative beta coefficient (-β = 0.161) implies that the higher the age, the lower the level of an individual's activities of daily living (ADL). Such a finding warns that older amputees may have a higher level of exertion in performing simple tasks required for living alone. In the context of the above research, the result shows a similarity with the earlier findings that age could impact the functional outcomes of individuals with limb loss. Thus, with each person's age, there is a chance for physiological changes and co-morbidities which may be a threat to the normal performance of daily activities. Moreover, the elderly might experience deterioration in their movement and strength, and this could also cause a problem in doing tasks such as dressing, grooming as well as cooking. The fact that age is significantly associated with the activities of daily living as well as the necessity of age-related factors in the rehabilitation programs for amputees underscore such significance. Considering that healthcare practitioners are usually the main people who interact with the elderly population, they should be more aware and adjust their approaches to give the elderly population more care and understanding [25]. They can be done through the set up of specific exercise programs that involve boosting muscle strength and balance, specialized assistive devices that assist with the compensations of functional limitations, and provision of support services to enhance independence and quality of life.

**ADL and Gender**

The results from the Simplistic Linear Regression Statistical Test suggest that the gender factor of the participants is a significant factor in the activities of daily living (ADL) under lower limb amputees. The coefficient (β) of -0.135 shows an inverse relation between gender and ADL, so the female class (coded by 2) is related to a lower level of ADL than the male class (coded by 1). Consequently, this finding is confirmed by a p-value of 0.008, hence the relationship between gender and ADL is proven to be statistically significant. This being, it becomes clear that gender is also meanly identified as an element that determines the extent of engagement in ADL among amputees. Female participants have a lower average ADL score in comparison with male participants in general. This result coincides with previous research on the role of gender in modulating various health and functional aspects including the case of persons with disabilities. Such as, it has been shown that among those with limb loss, females oftentimes have more difficulty in mobility and self-care compared to males, which could be attributed to physiological, psychological, or social factors [3,7]. A negative regression coefficient indicates that the female group is associated with lower levels of ADL and this finding needs to be interpreted cautiously. This study controls for other variables including age, level of amputation, and comorbidities, but some elements are not measured that may affect the relationship between gender and ADL among amputees. As well as the degree of association direction and magnitude may differ from context to context and from one sample to another. Future studies may concern the potential mediators or moderators involved in the gender-ADL connection to have a more complete understanding of the nature of this relationship. The results of the simple linear regression model have suggested that gender can be taken as a significant factor in ADL among amputees. The negative value of the slope

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indicates that the ADL score is inversely related to gender, with the existence of this relationship proved by the p-value being statistically significant. This also highlights the necessity of gender-specific interventions and support strategies to be considered and accommodated to improve the functional outcome and quality of life of people with limb loss. More research is needed for the study of the mechanisms that produce the gender gap in ADL among amputees and propose ways to reduce the gap.

**ADL and Amputation Reasons**

The results from a simple linear regression study show an existing significant relationship between the reasons for amputation and activities of daily life (ADL) among amputees (β= 0.304; p= 0.000). The fact that the outcome of amputation depends on the reason for it, whether it is disease, war-related injuries, or accident suggests that the reasons for amputation play a significant role in the prediction of the level of independence in performing daily tasks. The β coefficient of 0.304 shows a positive relationship between the predictor variable (amputation reasons) and the outcome variable (ADL) that is as the severity of amputation reasons goes from diseases to accidents, so the limitations in ADL increase. This research is in agreement with past studies that explain the multi-factorial nature of disability and impairment that is noted after one undergoes amputation. For instance, people who have amputated legs because of diseases frequently struggle more than those whose limbs are amputated by accident (e.g. war injuries or accidents) [16,26] to adjust to the prosthetic devices and to learn new skills again. There may be various reasons for this, including the comorbidities that are correlated with amputation, which can lead to immense physical and psychological trauma that a person can experience, thus impacting their ADL ability. As is the case with the discrepancy in rehabilitation outcomes among subjects with diverse etiologies of amputation. The researchers concluded with the results that the patients who had amputations due to vascular diseases had slower and less successful rehabilitation trajectories compared to those with trauma-related amputations. It implies that the damage condition and the pre-existed functions must be taken into account, to objectively check the cancellation reasons for the ADL [10].

ADL and Amputation Site

The rudimentary linear regression analysis resulted in the correction that the amputation site is significantly related to daily activities of life (ADL) for amputees. The regression coefficient (β) for the amputation site is reported as 0.138 (p = 0.005), which is statistically significant and a strong factor in determining the ADL outcomes. By this, we could conclude that those who have lost their lower limbs, numerical code 1, may be experiencing different ADL outcomes from those who lost their upper limbs, numerical code 2. The above outcome therefore accords with the past research indicating that the type and size of amputation can affect the functional outcome and quality of life for an individual who has lost a limb [27]. Lower limb amputations result in much more limited mobility and the ability to perform daily activities without difficulty than upper limb amputations, which may be the key reason for different ADL results. Low-limb amputees may have a greater need for rehabilitation and adaptive skills, and hence, they might need to spend more effort when undertaking normal tasks to maintain their independence. Furthermore, the p= value (0.005) of the regression coefficient implies that there is a statistically significant association between the location of amputation and ADL outcomes rather than just chance. This gives the results credibility and emphasizes the need for the account taken of the site of the amputation when coming up with function outcomes and intervention plans for amputees. It should be noticed by clinicians and rehabilitative specialists that they should adapt their methods of treatment individually to each type of amputation, describing its benefits and challenges.

**ADL and Duration**

The linear regression analysis allowed us to assert the findings that a significant connection exists between the time of the amputation and the activities of daily living (ADL) of the amputees. The regression coefficient (β = -0.374) manifests the negative relation between the variables. This is how with the length of amputation increase, where the level of ADL functioning among people who have undergone amputations is supposed to be decreased. Besides, the presence of this effect shows the expediency of the amputation timing for determining the prognosis of its effect on the performance of daily functions. During the analysis of the negative correlation between the duration of amputation and the level of performance of ADLs with the previous studies showing how challenging it is for those with a longer duration of limb loss to perform their day-to-day activities, the findings of the research were substantiated. Consequently, the duration of

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amputation is the cause of poor physical functionality, mobility, and also the quality of life measured [3]. Factors involved in muscle atrophy, joint stiffening, and psychosocial adjustment to limb loss among many others are the ones causing the decline in ADL performance [10]. Therefore, rehabilitation techniques that focus on IADL function may need to consider the amputee's period with the loss of the limbs so that they can get the necessary care. Moreover, the result shows that the amputation length also plays a significant role in ADL performances. Therefore, fast rehabilitation and intervention are key to enhancing the quality of life following limb loss. Providing prosthetics right away, physical retraining, as well as psychological help can significantly improve the life of the amputee and the quality of his or her daily tasks. Nevertheless, primary care should involve preventive strategies for secondary conditions which may, in turn, be caused due to long-term immobility or misuse of prosthetics so that users can enjoy better long-term health results [14, 28].

## 4. Conclusions

The results confirm the possibility that such problems are highly prevalent among amputees. As an example, the case of two-thirds of amputees who have such limitations is presented. Furthermore, the results of the linear regression analysis reflect the multifactorial nature of ADL impairment among this group of patients. Important factors in predicting the level of impairment include age, gender, reasons for amputation, location of amputation, and duration of amputation. Thus, amputees seeking interventions aimed at improving their ADL function should pay particular attention to those comprehensive interventions and take into account a range of factors that influence ADL. The service will focus exclusively on designing customized rehabilitation solutions, providing assistive devices, psychological support, and community strengthening. Furthermore, healthcare professionals should focus on early intervention and personalized strategies to avoid amputation which in turn will affect the ability of people with limb loss to perform activities of daily living and improve their quality of life.

## Limitation

There are multiple limitations researchers were challenged with, such as the design of the study was cross-sectional, blood samples were collected during the study and samples can be rejected when they are not reliable.

## Ethics approval and consent to participate

The ethical approval was obtained from the Research Ethics Committee of the College of Health and Medical Technologies/ Kufa, Al-Furat Al-Awsat Technical University (No.: 713, dated 29/10/2023).

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